2022 Lake Parker Water Quality Monitoring Results: Lay Monitoring Program and LaRosa Partnership Program

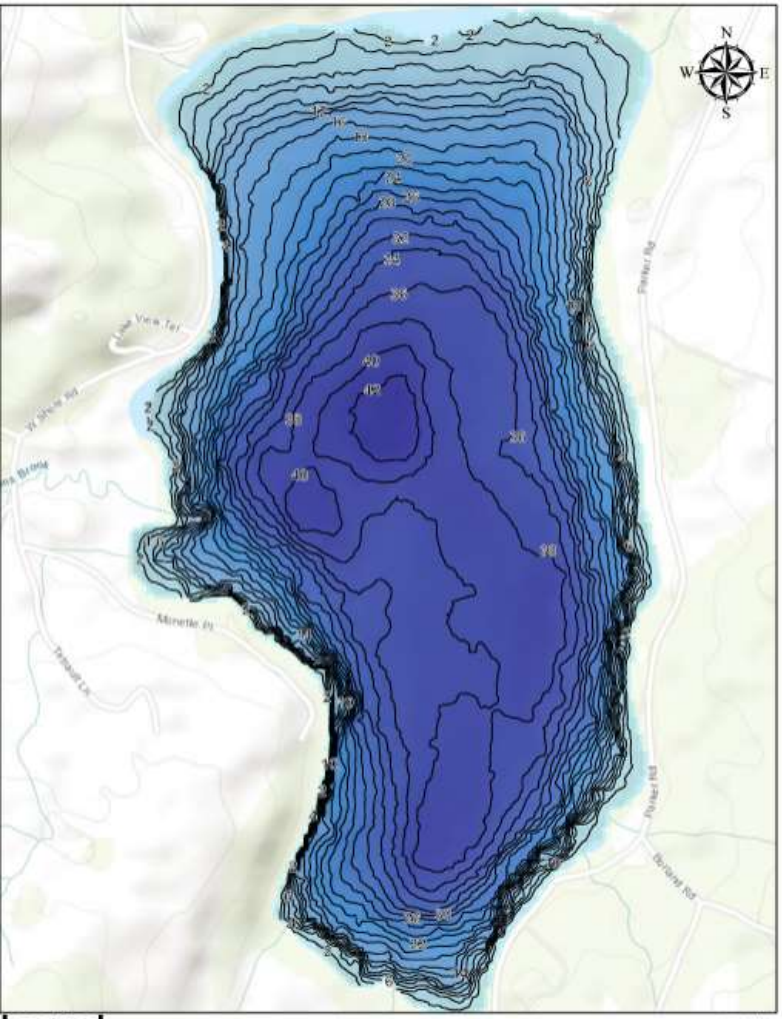
Mark Mitchell, Lake Monitoring and Community Outreach Coordinator
VT Department of Environmental Conservation, UVM Lake Champlain Sea Grant

Lay Monitoring Program (LMP) Lake Sampling Overview

- Weekly from Memorial Day to Labor Day (minimum of 8 samples for summer mean):
  - *Basic Sampling:* Measure Secchi disk transparency depth (clarity)
  - *Supplemental Sampling:* Collect water samples with hose at twice Secchi depth that are lab tested for total phosphorus (nutrient) concentration and chlorophyll-a (algae) concentration
  - Complete a lake sampling webform (and report cyanobacteria conditions)

https://dec.vermont.gov/watershed/lakes-ponds/monitor/lay-monitoring

Lake Parker, West Glover, VT



Legend

Depth (ft.)

High : 0

Low : 44

0 0.1 0.2 0.4 Miles

Depth Contour (2 ft.)

Source Data Collected: 8/14/2018

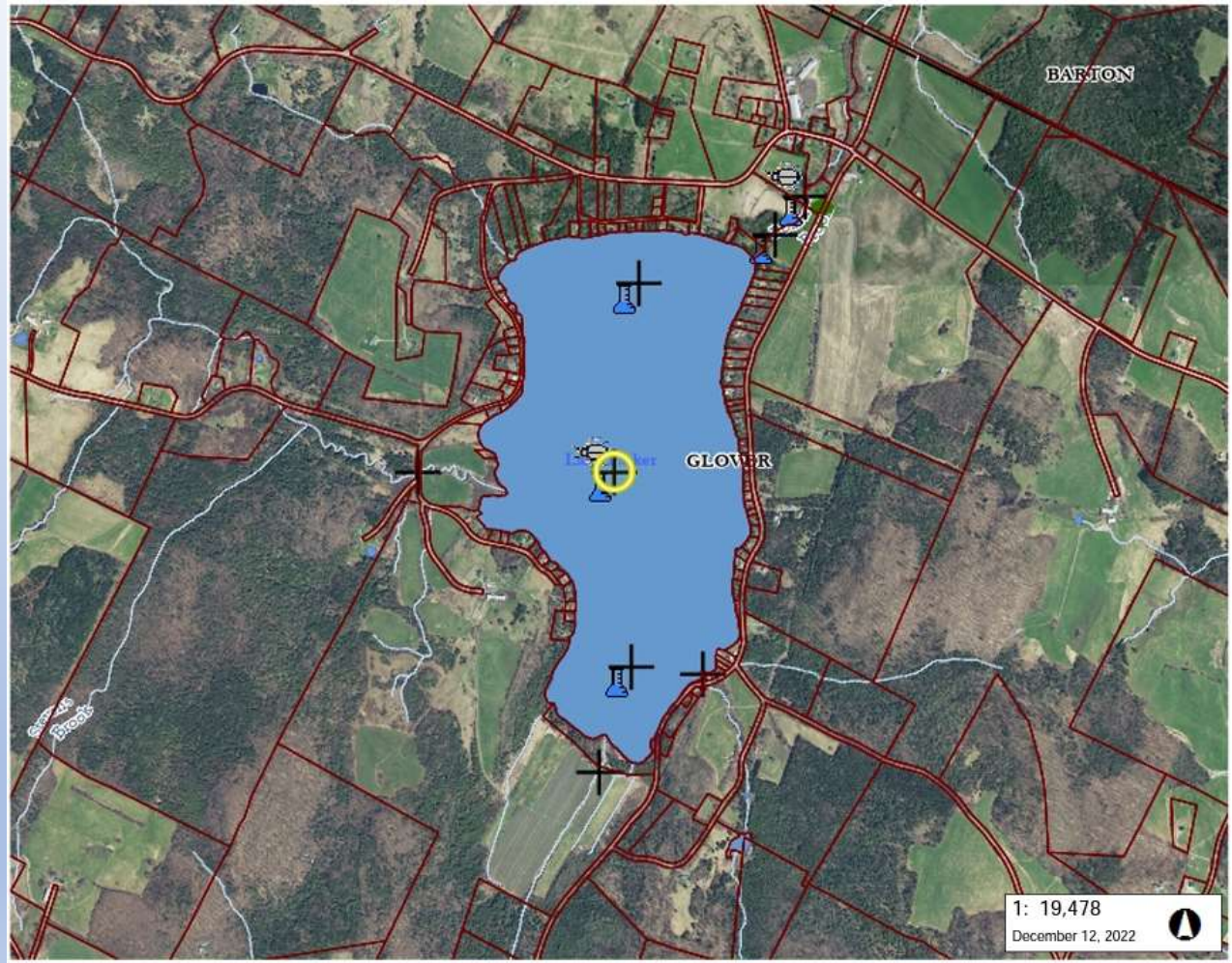
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION
LAKES & PONDS PROGRAM

VERMONT

Lake Parker Monitoring Station #1 (Center)

Vermont Agency of Natural Resources

vermont.gov



990.0 0 495.00 990.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 1623 Ft. 1cm = 195 Meters

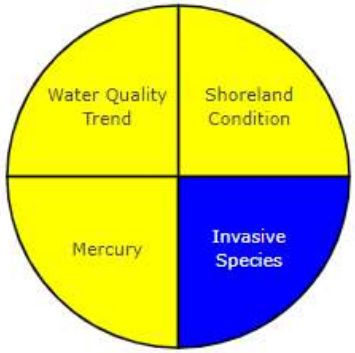
THIS MAP IS NOT TO BE USED FOR NAVIGATION

Vermont Lake Score Card

Lake Parker

https://dec.vermont.gov/watershed/lakes-ponds/data-maps/scorecard

Scores | Water Quality Data | Lake Information



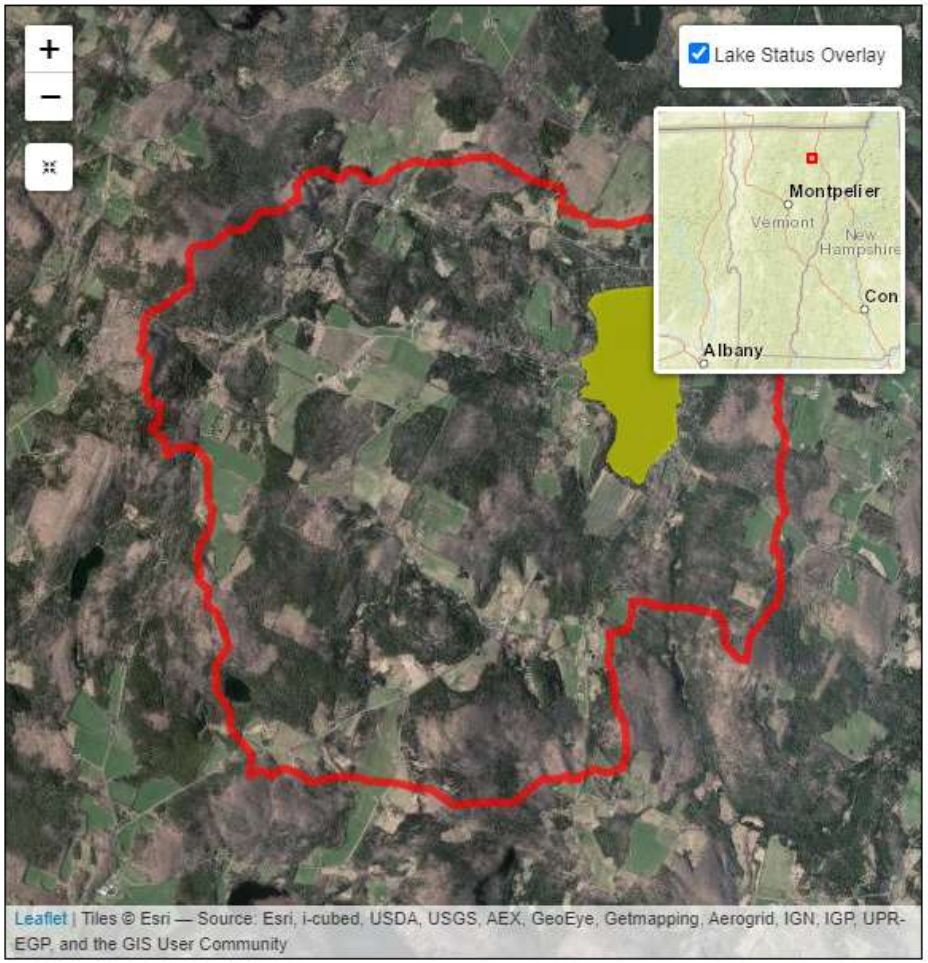
Watershed:	Highly Disturbed
WQ Standards:	Stressed

Details

Stressed – Organic Enrichment - DO
Stressed – Phosphorus

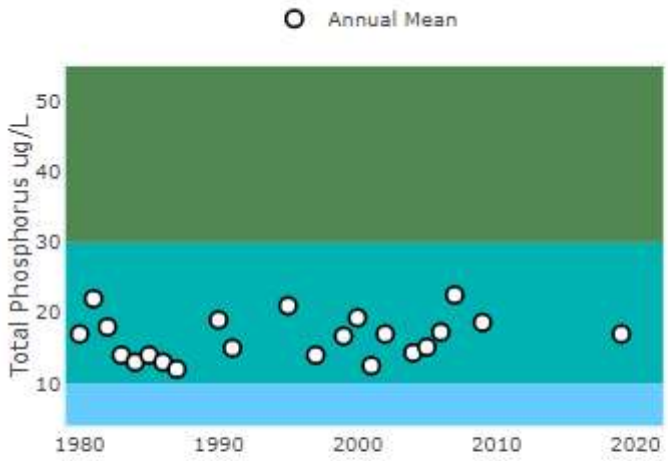
Color Scoring System
- Good Conditions
- Fair Conditions
- Poor Conditions
- Insufficient Data

Learn How Lakes Are Scored



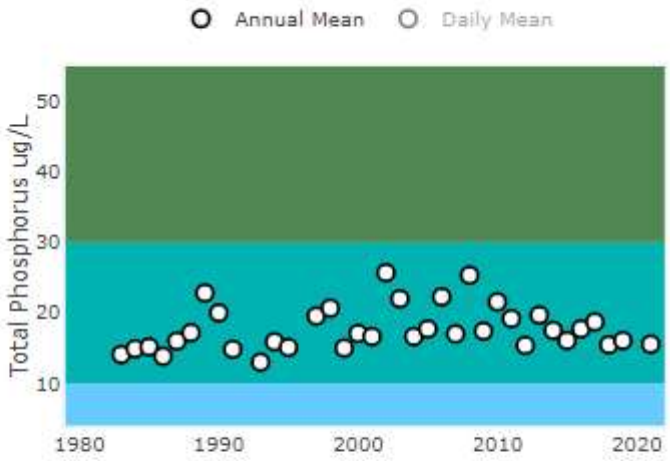
Spring Phosphorus

Trend: Stable (p-value=0.3361)



Summer Phosphorus

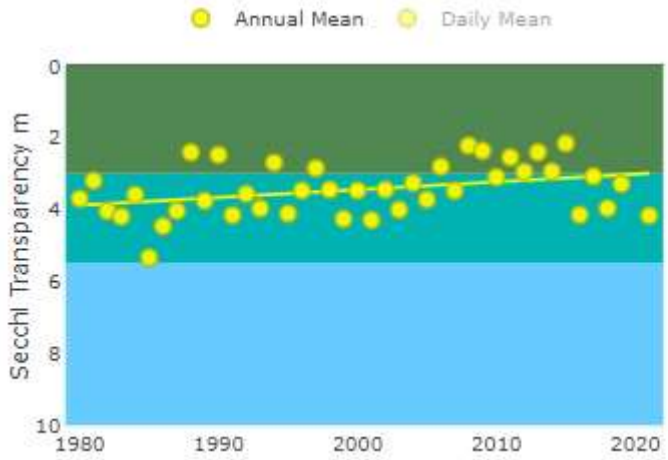
Trend: Stable (p-value=0.0993)



LAKE PARKER SCORE CARD WATER QUALITY TRENDS

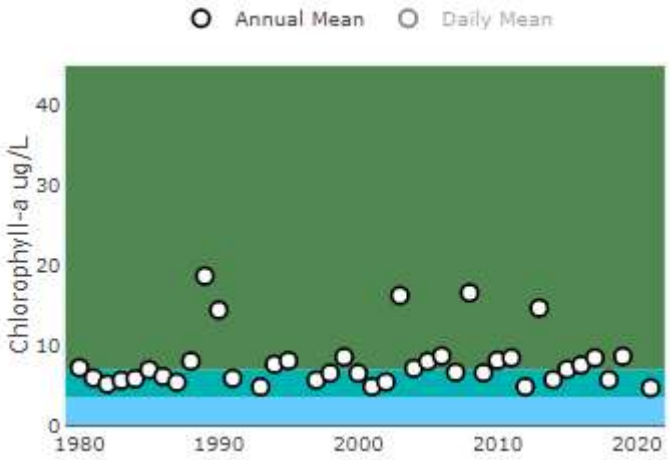
Summer Secchi

Trend: Significantly Decreasing (p-value=0.0262)



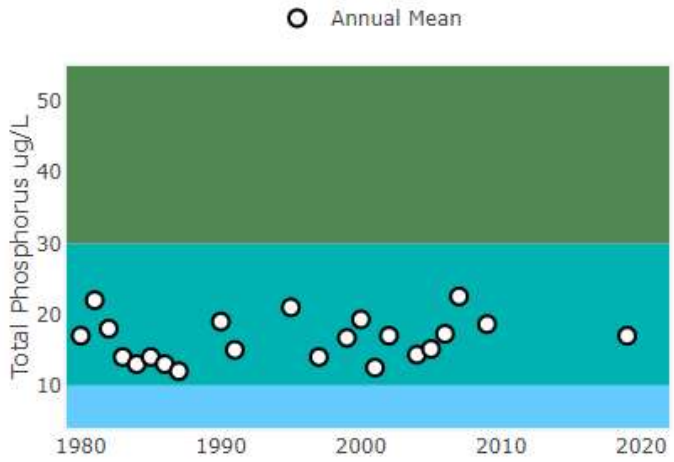
Summer Chlorophyll-a

Trend: Stable (p-value=0.271)



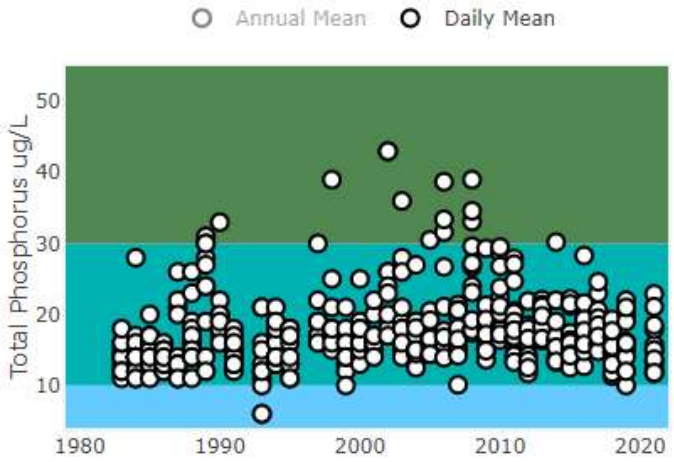
Spring Phosphorus

Trend: Stable (p-value=0.3361)



Summer Phosphorus

Trend: Stable (p-value=0.0993)



LAKE PARKER SCORE CARD WATER QUALITY TRENDS

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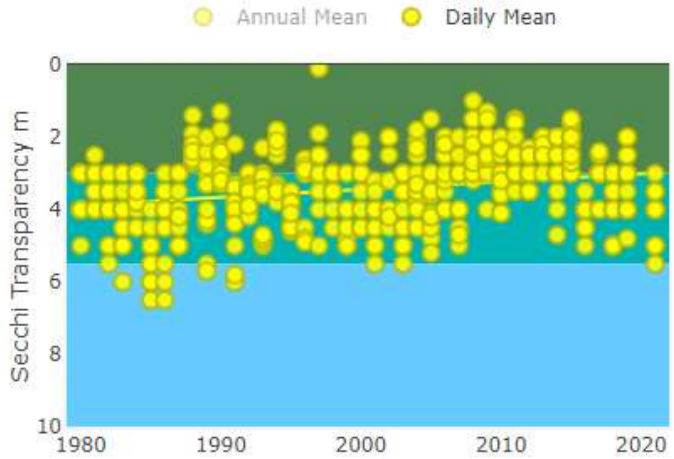

Summer Chlorophyll-a

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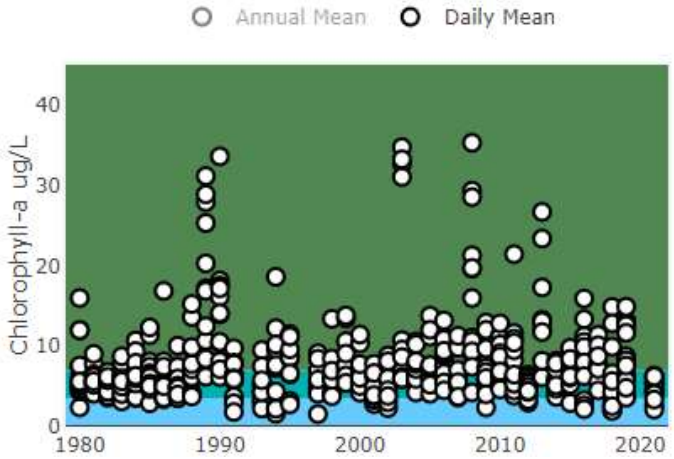
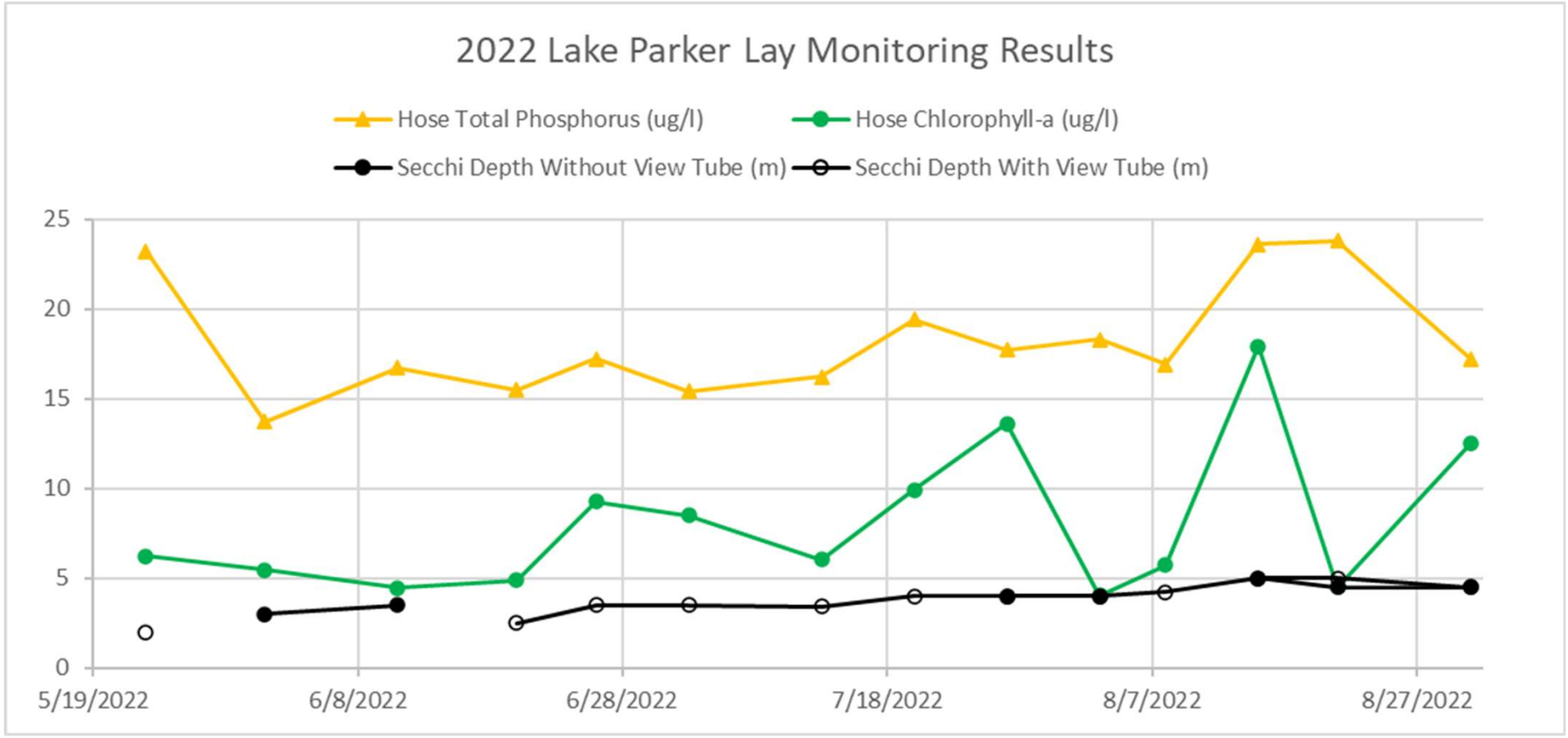
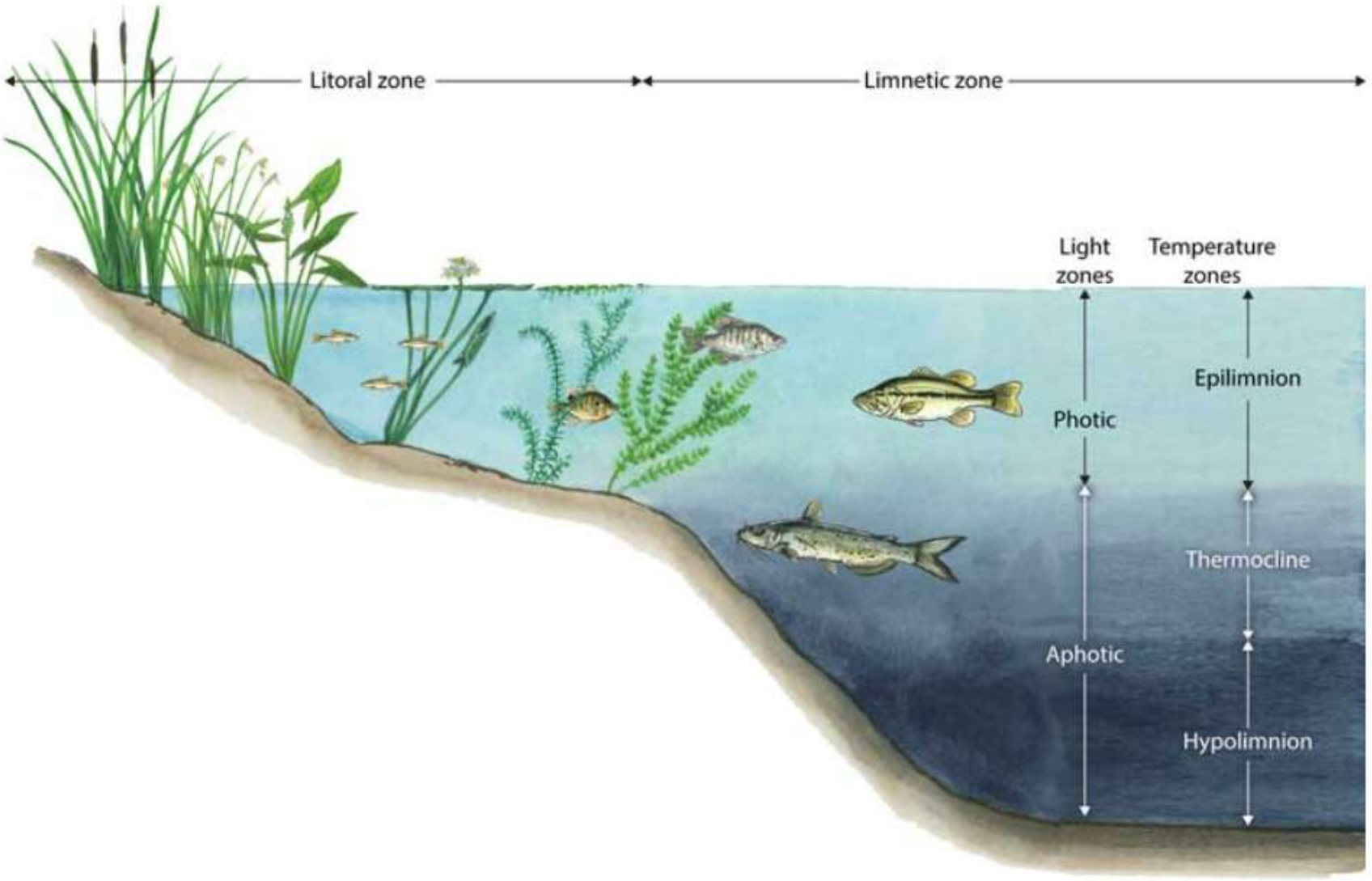


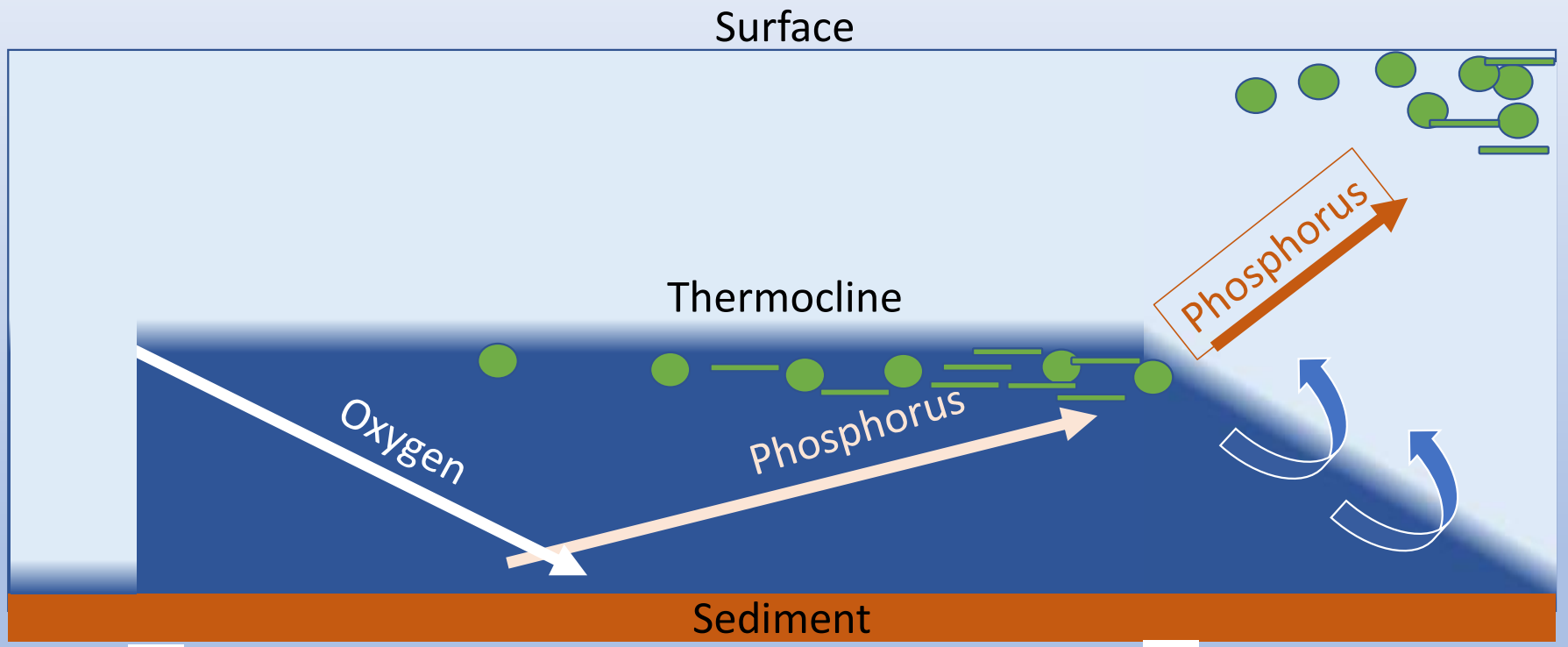

2022 Lake Parker Lay Monitoring Results
Hose Total Phosphorus (ug/l)
Hose Chlorophyll-a (ug/l)
Secchi Depth Without View Tube (m)
Secchi Depth With View Tube (m)
25
20
15
10
5
0
5/19/2022
6/8/2022
6/28/2022
7/18/2022
8/7/2022
8/27/2022



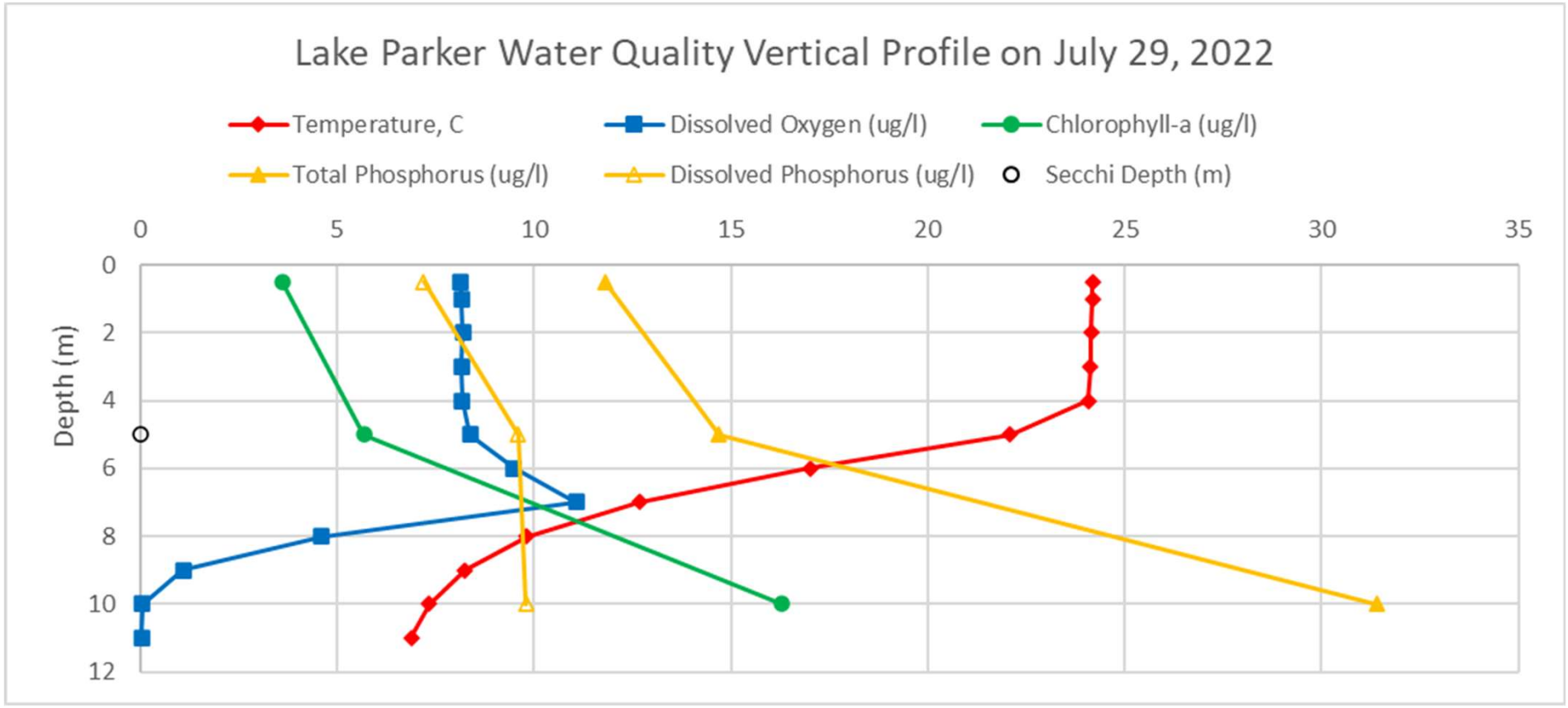
(Image courtesy of Kasco Marine)

https://kascomarine.com/blog/pond-lake-zone-identification/

Internal Phosphorus Loading From Anoxic Sediment



(Image courtesy of Peter Isles, VT DEC)


Lake Parker Water Quality Vertical Profile on July 29, 2022
Temperature, C
Dissolved Oxygen (ug/l)
Chlorophyll-a (ug/l)
Total Phosphorus (ug/l)
Dissolved Phosphorus (ug/l)
Secchi Depth (m)
0
5
10
15
20
25
30
35
Depth (m)
0
2
4
6
8
10
12

Sampling Date	Hose Sample Depth (m)	Hose Total Phosphorus (ug/l)	Hose Chlorophyll-a (ug/l)	Secchi Depth Without View Tube (m)	Secchi Depth With View Tube (m)
5/23/2022	4	23.2	6.2		2
6/1/2022	6	13.7	5.46	3	
6/11/2022	7	16.7	4.44	3.5	
6/20/2022	5	15.5	4.88		2.5
6/26/2022	7	17.2	9.24		3.5
7/3/2022	7	15.4	8.48		3.5
7/13/2022	6.8	16.2	6.01		3.4
7/20/2022	8	19.4	9.92		4
7/27/2022	8	17.7	13.6	4	4
8/3/2022	8	18.3	4.01	4	4
8/8/2022	8.4	16.9	5.7		4.2
8/15/2022	10	23.6	17.9	5	5
8/21/2022	10	23.8	4.47	4.5	5
8/31/2022	9	17.2	12.5	4.5	4.5
Mean		**18.2**	**8.06**	**4.07**	**3.8**
VT Class B2 Standards	**Photosynthetic (Euphotic) Zone**	**18**	**7**	**2.6**	**2.6**

LAKE PARKER

Annual Data (Station 1)

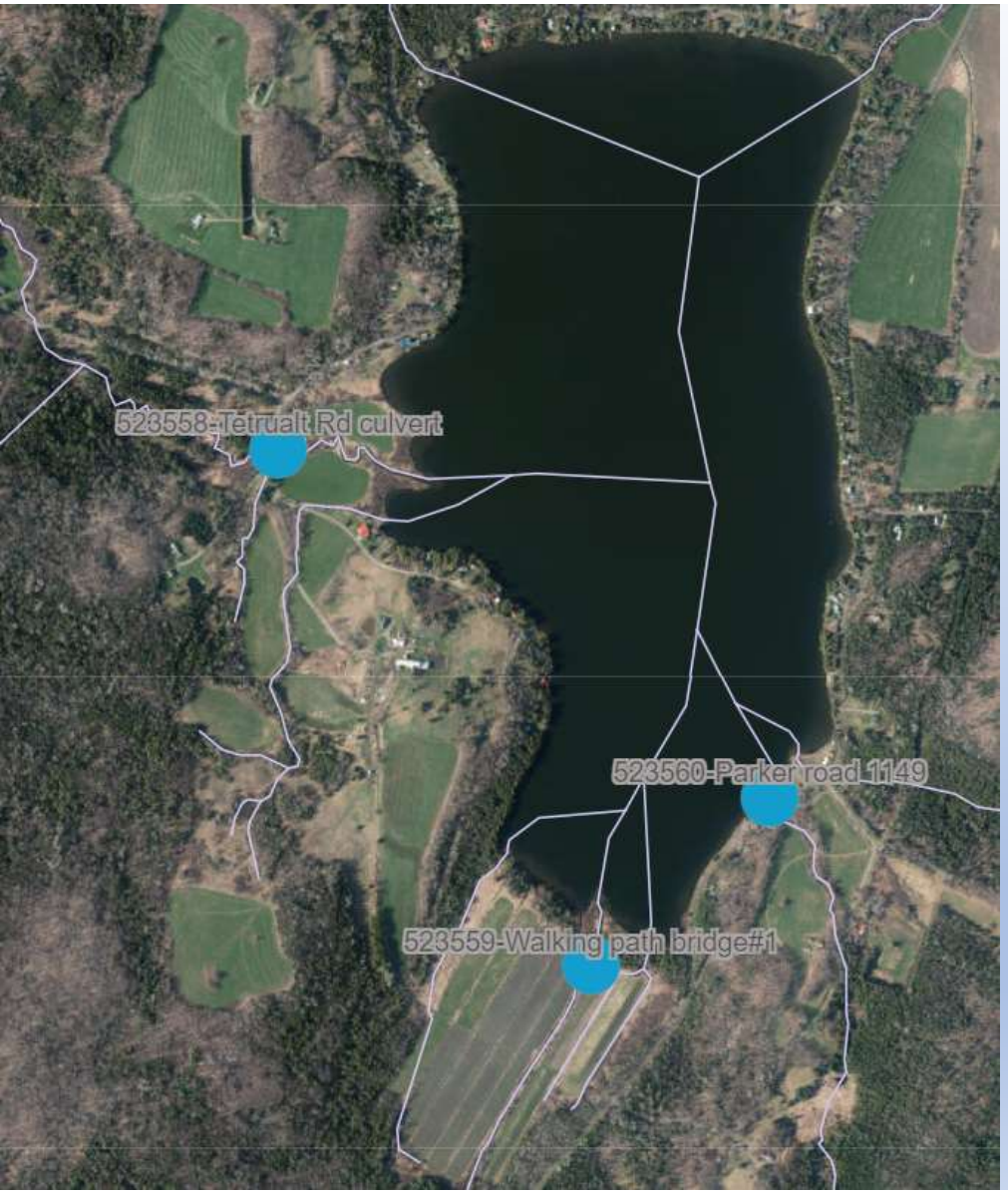
Year	Days Sampled	Secchi (m)	Secchi View Tube (m)	Chloro-a (µg/l)	Summer TP (µg/l)	Spring TP (µg/l)
1979	23	3.2		6.2		
1980	13	3.7		7.2		17.0
1981	13	3.2		5.9		22.0
1982	13	4.0		5.2		18.0
1983	13	4.2		5.6	14.1	14.0
1984	13	3.6		5.8	14.9	13.0
1985	12	5.3		6.9	15.2	14.0
1986	12	4.5		6.1	13.8	13.0
1987	12	4.0		5.4	16.0	12.0
1988	12	2.4		8.0	17.2	
1989	12	3.8		18.7	22.8	
1990	12	2.5		14.4	20.0	19.0
1991	12	4.2		5.9	14.8	15.0
1992	13	3.6				
1993	12	4.0		4.8	13.0	
1994	10	2.7		7.6	15.9	
1995	11	4.1		8.1	15.1	21.0
1996	9	3.5				
1997	9	2.8		5.7	19.6	14.0
1998	9	3.4		6.5	20.7	
1999	11	4.3		8.5	15.0	16.7
2000	12	3.5		6.5	17.1	19.3
*VT Standard**		*2.6*		*7.0*	*18.0*	

** VT Water Quality Standards Nutrient Criteria for Class B2 Lakes > 20 acres.*

Annual Data (Station 1)

Year	Days Sampled	Secchi (m)	Secchi View Tube (m)	Chloro-a (µg/l)	Summer TP (µg/l)	Spring TP (µg/l)
2001	11	4.3		4.8	16.6	12.3
2002	10	3.4		5.4	25.7	17.0
2003	12	4.0		16.2	22.0	
2004	13	3.3		7.1	16.6	14.3
2005	11	3.7		8.0	17.7	15.1
2006	12	2.8		8.7	22.3	17.3
2007	12	3.5		6.6	17.0	22.5
2008	14	2.2		16.6	25.3	
2009	15	2.4		6.5	17.4	18.6
2010	14	3.1		8.1	21.6	
2011	14	2.5		8.4	19.2	
2012	12	2.9		4.8	15.4	
2013	9	2.4		14.7	19.7	
2014	12	2.9		5.7	17.5	
2015	15	2.2		7.0	16.1	
2016	14	4.1		7.5	17.7	
2017	12	3.1		8.4	18.7	
2018	13	4.0		5.7	15.5	
2019	15	3.3		8.6	16.1	17.0
2021	13	4.2		4.7	15.6	
*VT Standard**		*2.6*		*7.0*	*18.0*	

** VT Water Quality Standards Nutrient Criteria for Class B2 Lakes > 20 acres.*



LaRosa Partnership Program (LPP) Tributary Sampling Overview

- Tributaries first sampled in 2022 ~biweekly (8X) from April through July + ~2 storm events
- 523558-Tetrualt Rd culvert
  - Effects from upstream farms
  - Overall concern with nutrient levels in lake
  - Large sediment deposits at mouth of brook
- 523559-Walking path bridge#1
  - Effects from upstream farm
  - Overall concern with nutrient levels in lake
- 523560-Parker road 1149
  - Overall concern with nutrient levels in lake

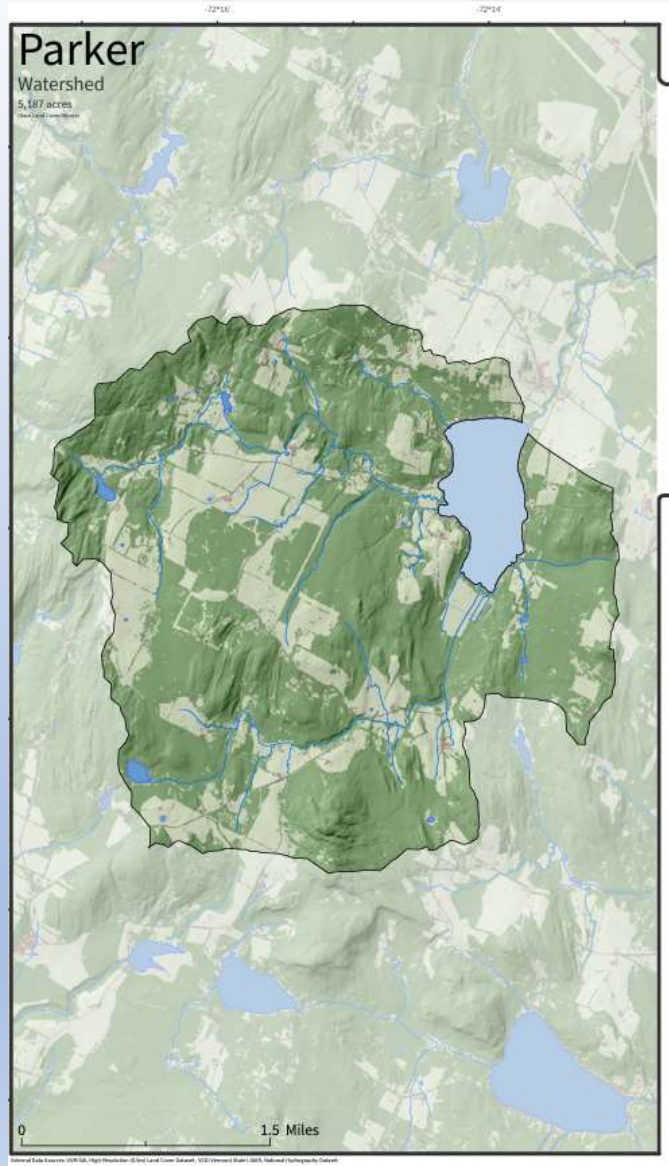
LPP Sample Parameters Overview

Total Phosphorus

- *Impacts*
  - Feeds plants, algae and cyanobacteria
  - Aquatic Biota, Aesthetics, Recreation Uses
- *Human Sources*
  - Runoff from roads, lawns, agriculture, logging
  - Malfunctioning septic systems
- *Vermont Water Quality Standards Nutrient Criteria for Aquatic Biota Use (+ Biological Criteria)*
  - Not to be exceeded at low median monthly flow (baseflow) during June through October
  - 12 ug/L for small high gradient streams (SHG)
  - 15 ug/L for medium high gradient streams (MHG)
  - 27 ug/L for warm-water medium gradient streams and rivers (WWMG)

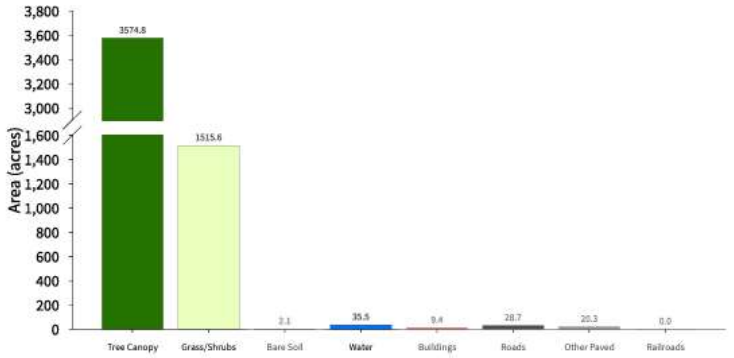
Total Nitrogen

- *Impacts*
  - Feeds plants, algae and cyanobacteria
  - Aquatic Biota, Aesthetics, Recreation Uses
- *Human Sources*
  - Runoff from roads, lawns, agriculture, logging
  - Malfunctioning septic systems
- *Vermont Water Quality Standards*
  - Not to exceed 5.0 mg/l as NO3-N at flows exceeding low median monthly flows, in Class B(1) and B(2) waters.
  - Not to exceed 2.0 mg/l as NO3-N at flows exceeding low median monthly flows, in Class A(1) and A(2) waters at or below 2,500 feet elev.



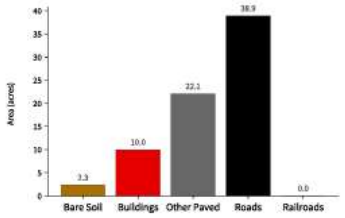
High-Resolution Land Cover Summary

Base Land Cover (Top-Down*)

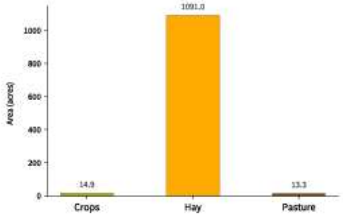


Supplemental Land Cover

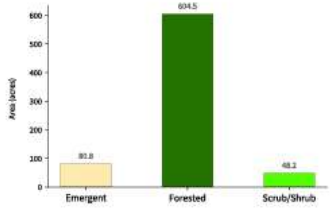
Impervious Surfaces (73.33 acres - 1.4 % of total)
(Bottom-Up**)



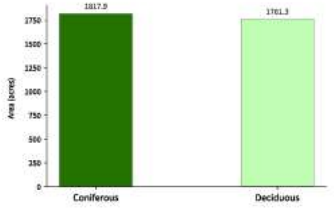
Agriculture (1,119.18 acres - 21.6 % of total)

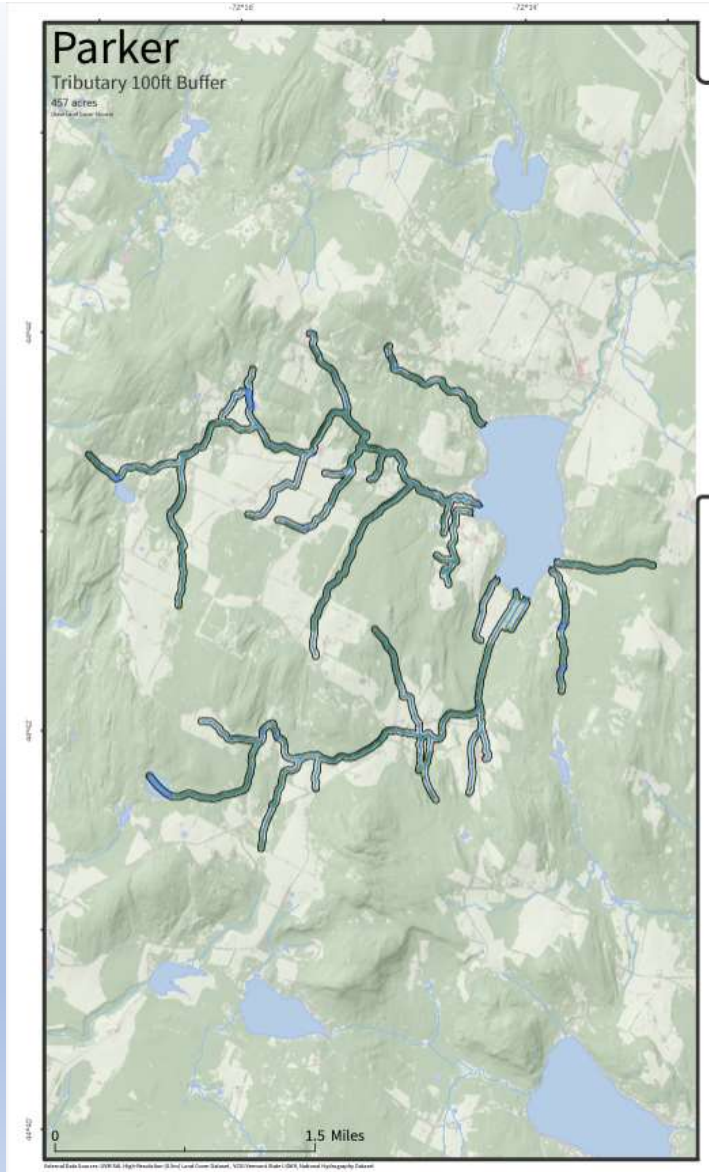


Wetlands (733.53 acres - 14.1 % of total)



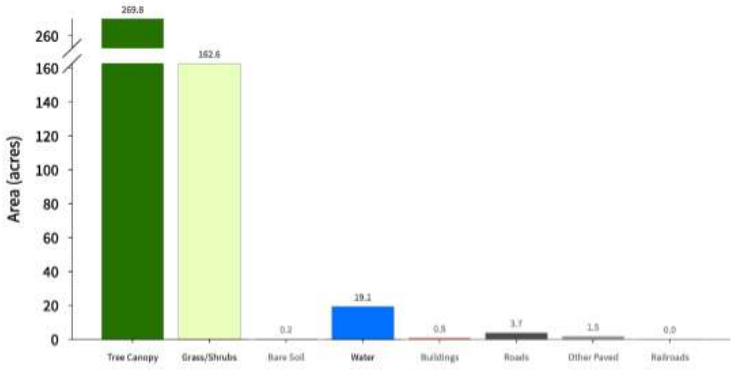
Tree Canopy (3,579.22 acres - 69 % of total)





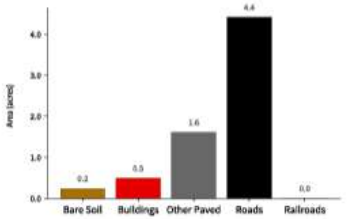
High-Resolution Land Cover Summary

Base Land Cover (Top-Down*)

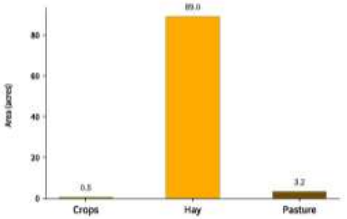


Supplemental Land Cover

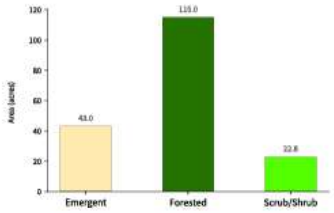
Impervious Surfaces (6.76 acres - 1.5 % of total)
(Bottom-Up**)



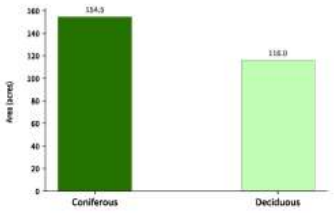
Agriculture (92.66 acres - 20.3 % of total)

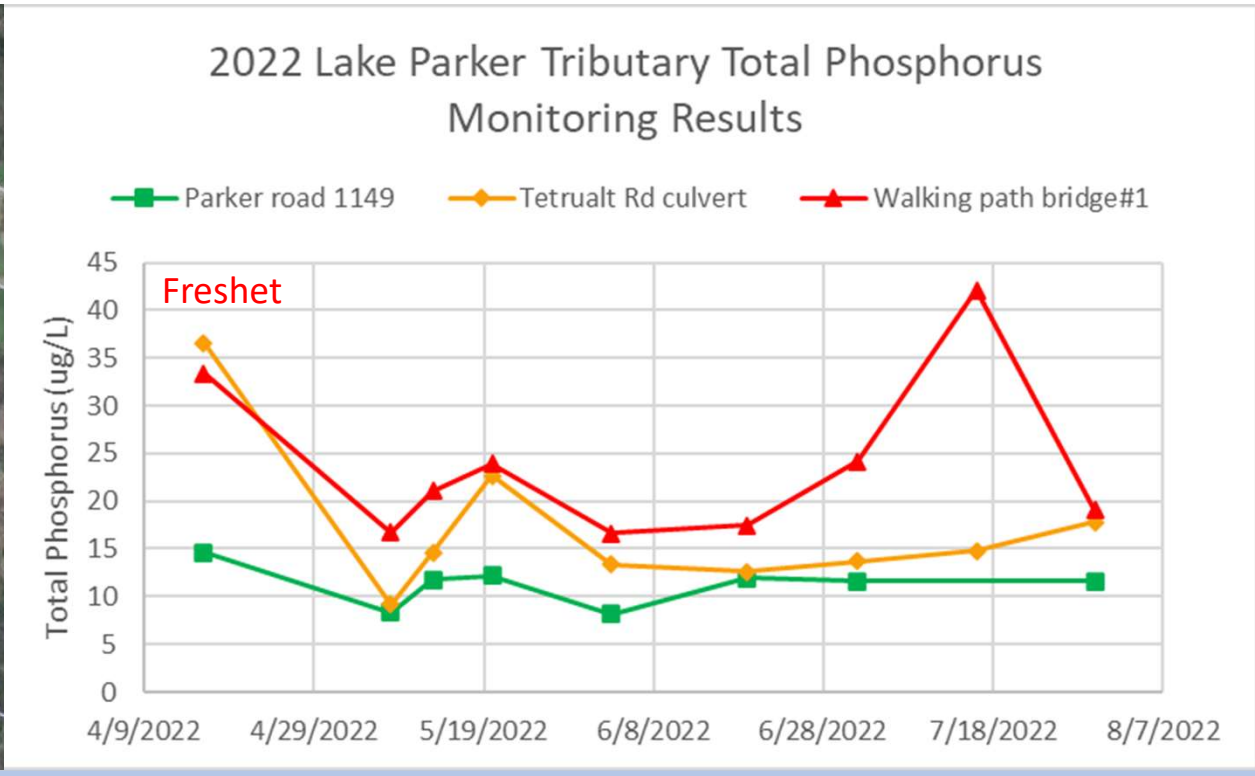


Wetlands (180.77 acres - 39.6 % of total)

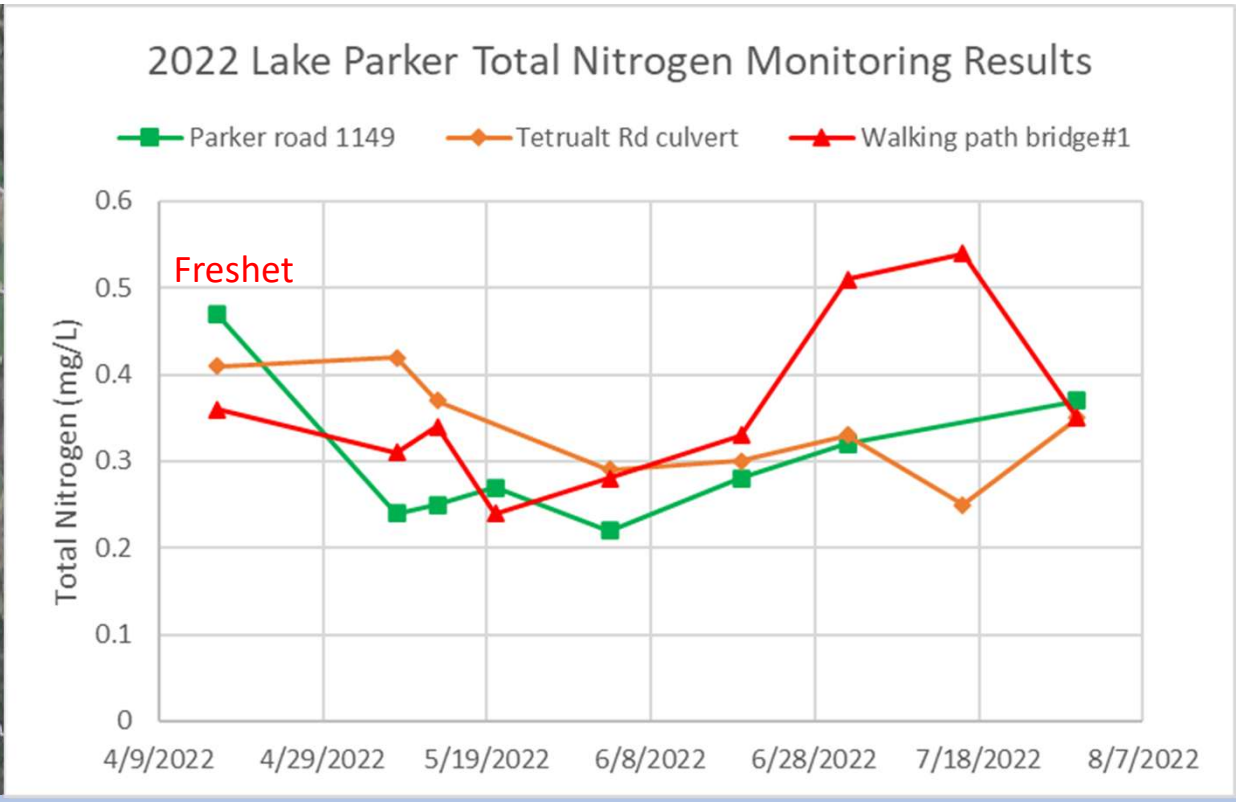


Tree Canopy (270.5 acres - 59.2 % of total)



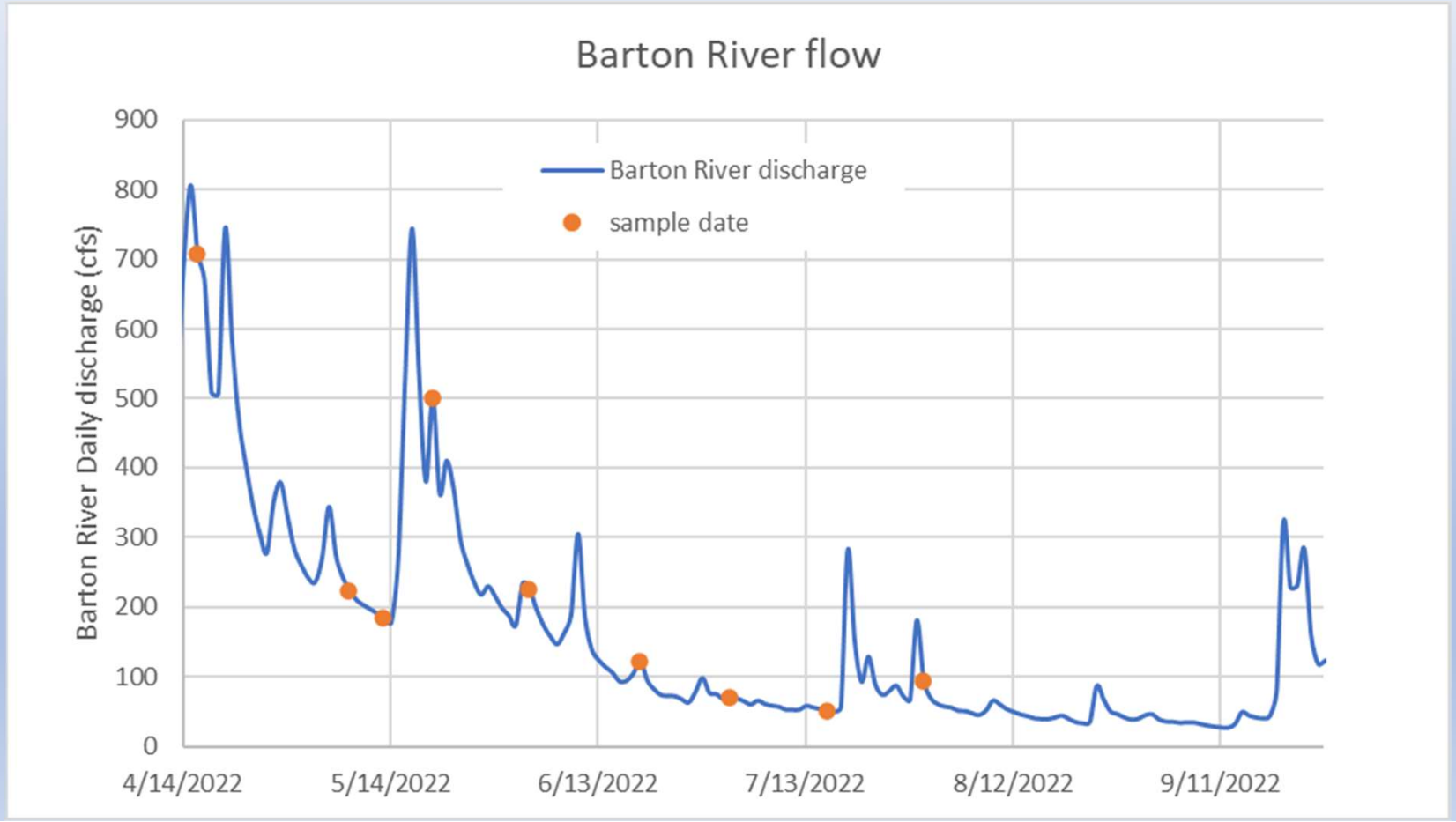


Tributary	Minimum TP (ug/l)	Average TP (ug/l)	2022 Max TP (ug/l)
Parker road 1149	8.2	11.3	14.6
Tetrualt Rd culvert	9.2	17.3	36.6
Walking path bridge#1	16.6	23.8	42.1



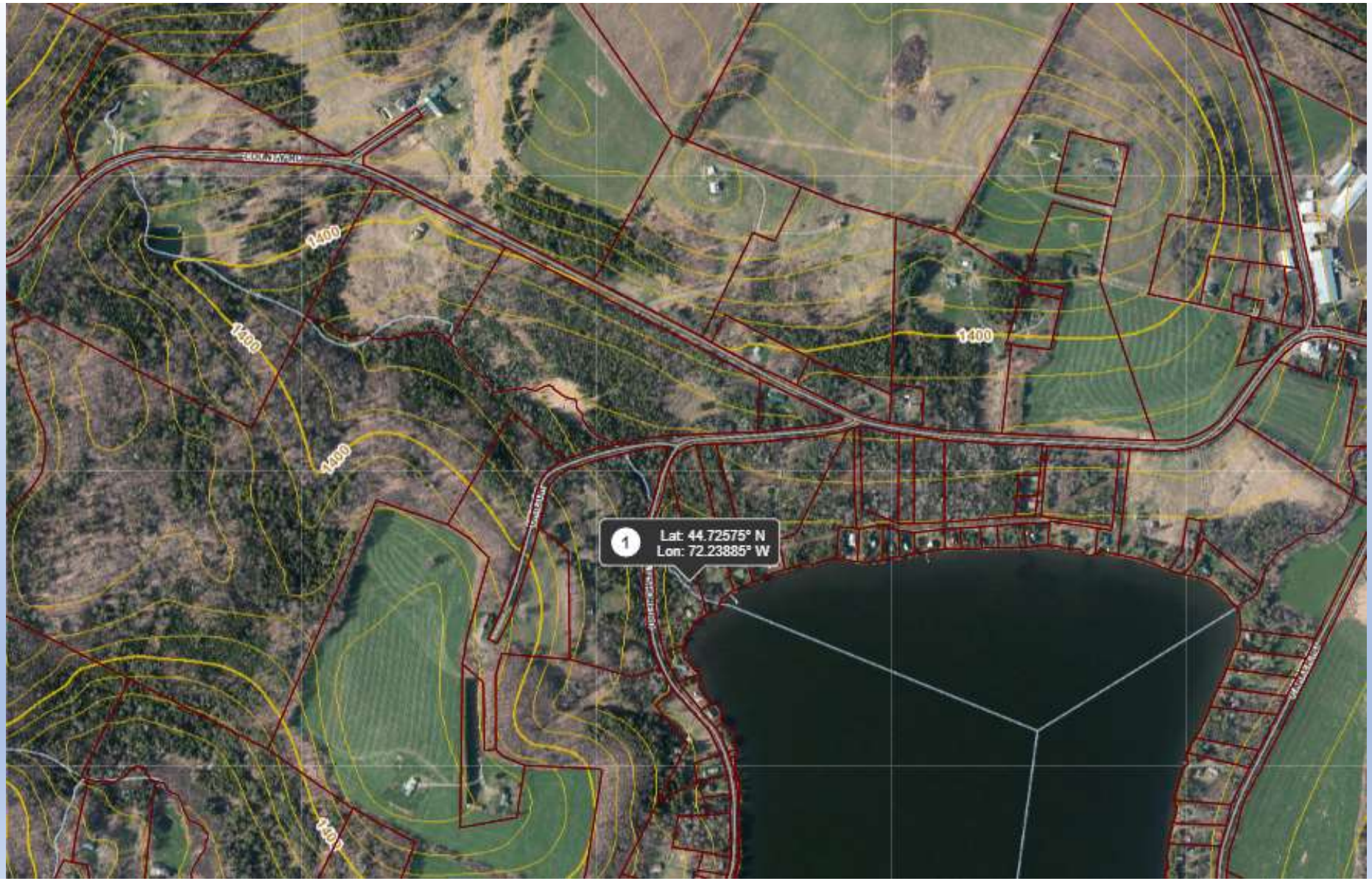
Tributary Site	Minimum TN (ug/L)	Average TN (ug/L)	Maximum TN (ug/L)
Parker road 1149	0.22	0.3	0.47
Tetrualt Rd culvert	0.25	0.34	0.42
Walking path bridge#1	0.24	0.36	0.54

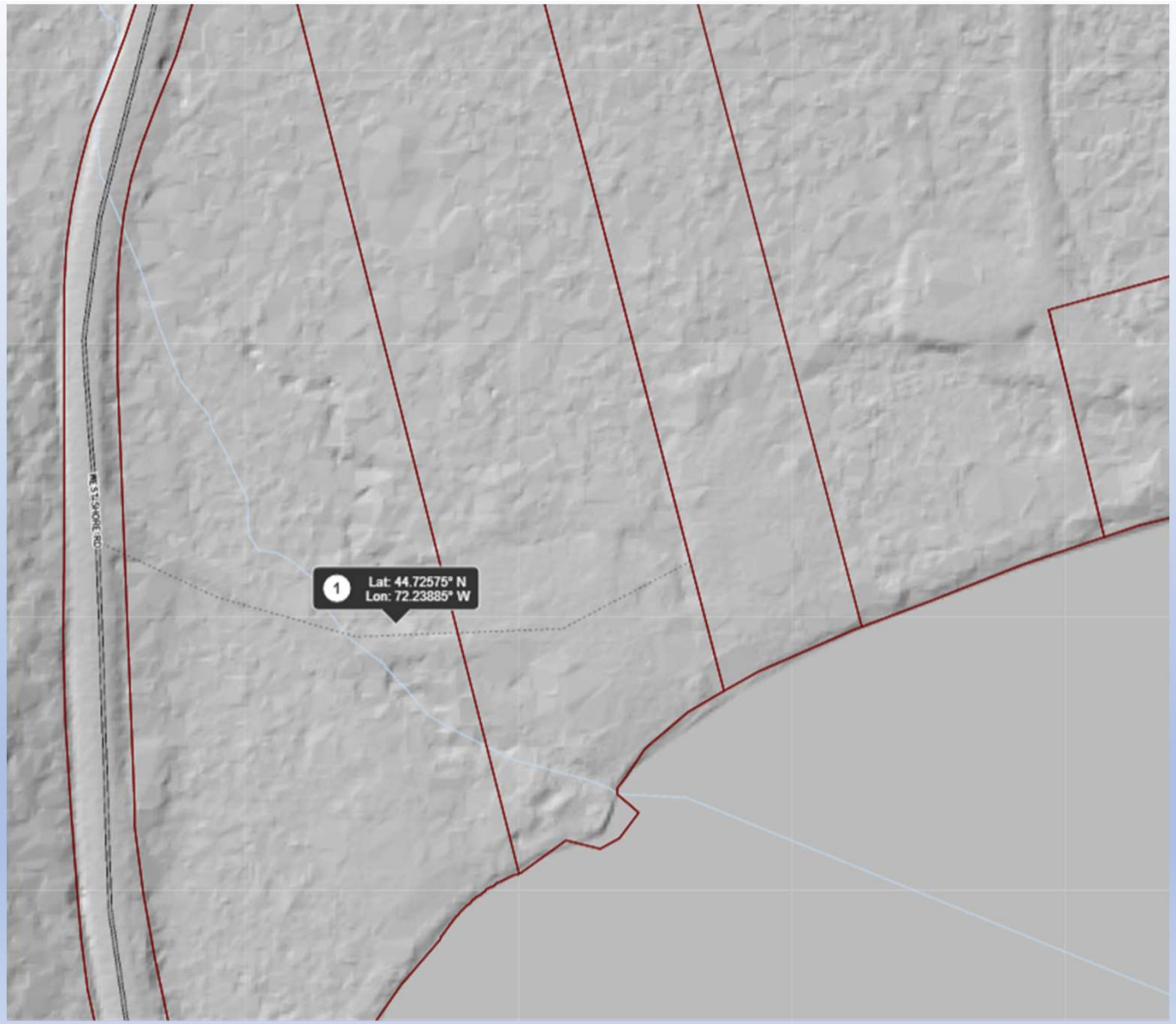
USGS Streamflow – Barton River, Coventry



2022 Monitoring Summary & 2023 Next Steps

- Lay Monitoring Program (LMP)
  - 2022 Summary: Deep hose samples have higher total phosphorus concentrations than surface samples due to internal loading from anoxic sediment
  - 2023 Next Steps: LMP volunteer collects biweekly surface and near-bottom (1 m) samples while LMP coordinator collects water quality vertical profile during visit; add caffeine testing as human wastewater indicator (i.e. septic systems)
- LaRosa Partnership Program (LPP)
  - 2022 Summary: Highest TP/TN from Walking path bridge#1 & Tetrualt Rd culvert
  - 2023 Next Steps: LPP volunteers continue collecting biweekly samples through August at all sites with a focus on Walking path bridge#1 & Tetrualt Rd culvert; add NE tributary site (see maps in slides below)


1400
1400
1400
1400
1400
1
Lat: 44.72575° N
Lon: 72.23885° W


1
Lat: 44.72575° N
Lon: 72.23885° W
WEST SHORE RD